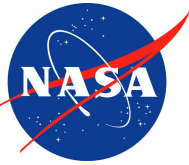




# *Learning Automation Update*

*September 18, 2013*

Avijit Mukherjee  
Banavar Sridhar  
Deepak Kulkarni  
Heather Arneson  
Shon Grabbe



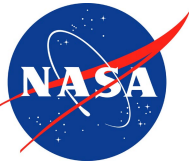
# *Research Objective*

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Given relevant NAS status, weather and traffic information determine the “best” collection of Traffic Management Initiatives to implement for day-of-operation planning purposes.

## Assumption:

- 2013 work focused exclusively on using weather observations
- Future work will consider weather forecasts



# 2013 Accomplishments

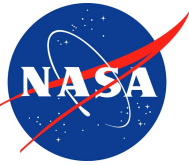
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## Learning Automation Related

- Developed initial approaches for clustering days based on en route convective impacts and the location and cause of Ground Delay Programs
- Analyzed and ranked historical routing options used in conjunction with the en route clusters
- Exploring refined reroute clustering approaches to help define the “national plan”
- Prototype system developed for visualizing clustering and Digital TMI results

## Related Data Mining Work

Developed models for predicting if Ground Delay Program and Miles-in-Tail restrictions are required given weather and traffic observations

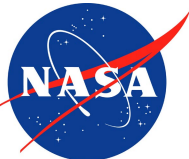


# *Evaluator Concept Connection*

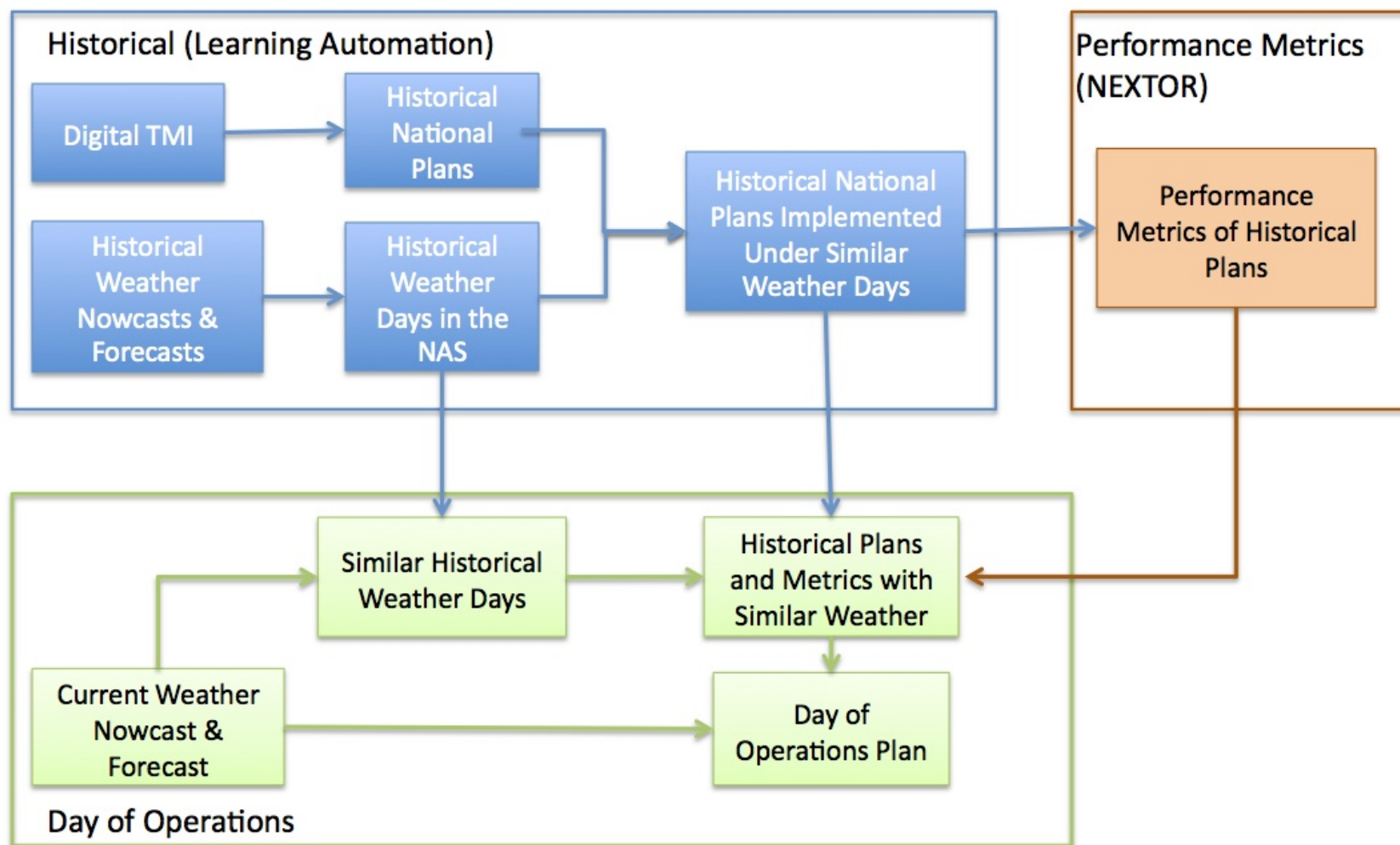
Clustering days based on historical convective weather and the location and cause of Ground Delay Programs

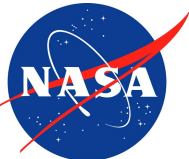
“... the Evaluator makes use of its learning automation capabilities to incorporate lessons learned from earlier interventions, their project impact and the actual results experienced. The experiences used to to automatically inform future response strategies – or the prioritization of the options against one another on the list of candidate responses.”

- Analysis of reroutes used in conjunction with similar convective weather constraints
- Route clustering work (simplifies the list of candidate responses)

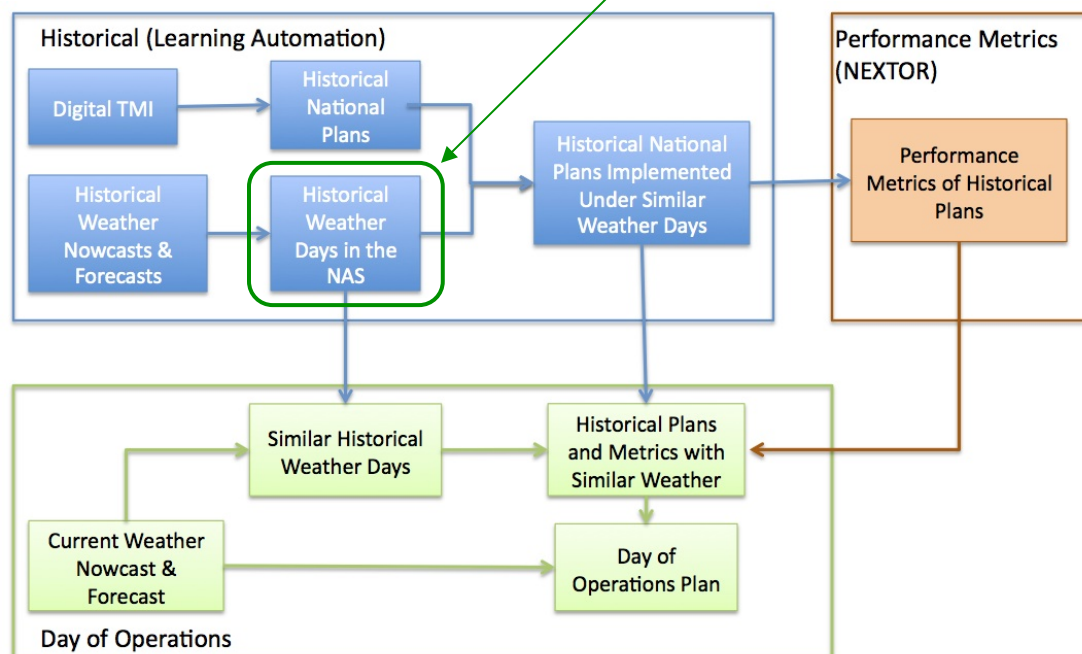


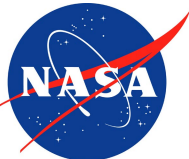
# Approach



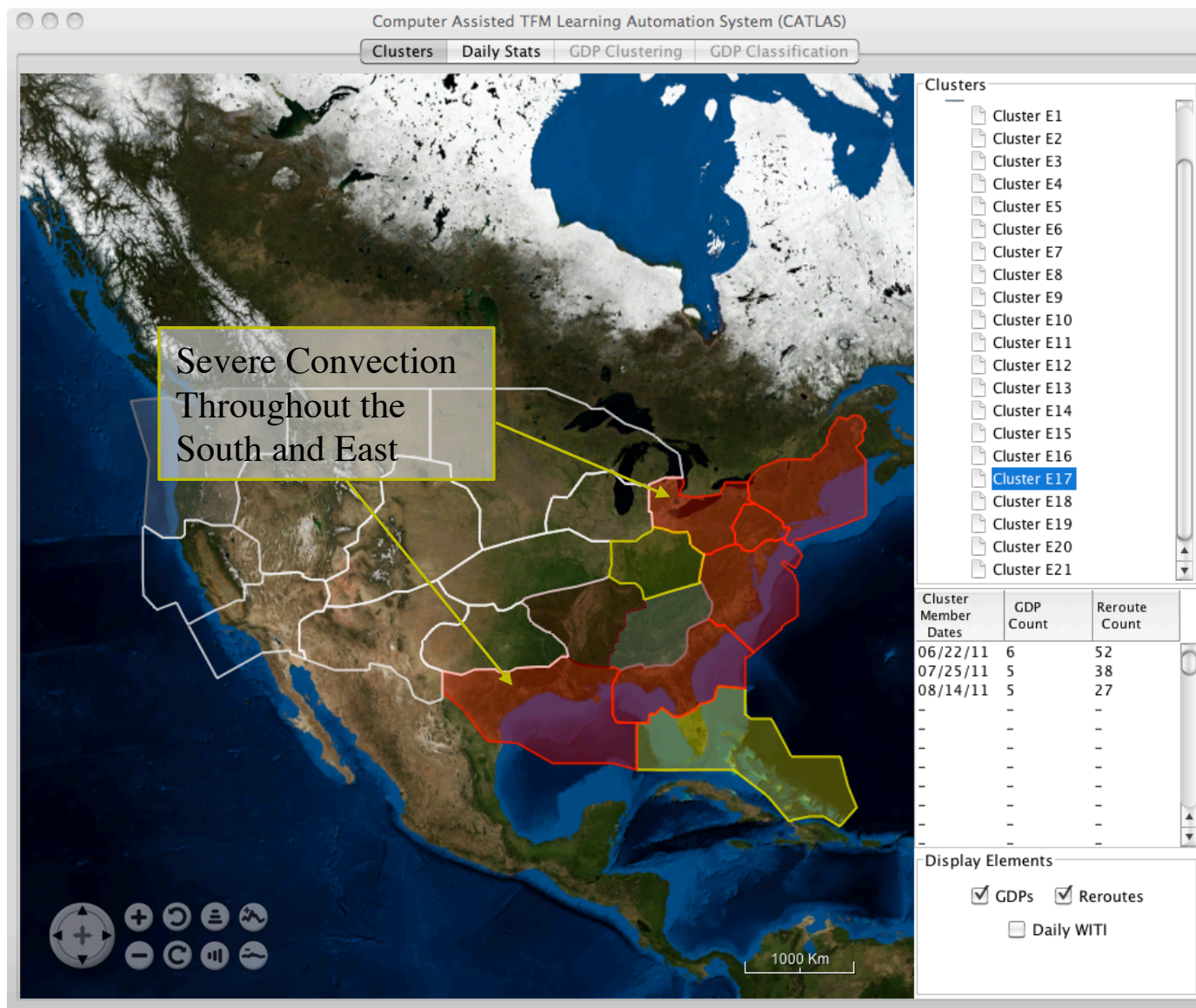


## Historical Days in the NAS: an Airspace Perspective

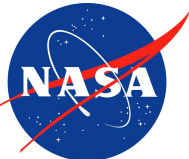




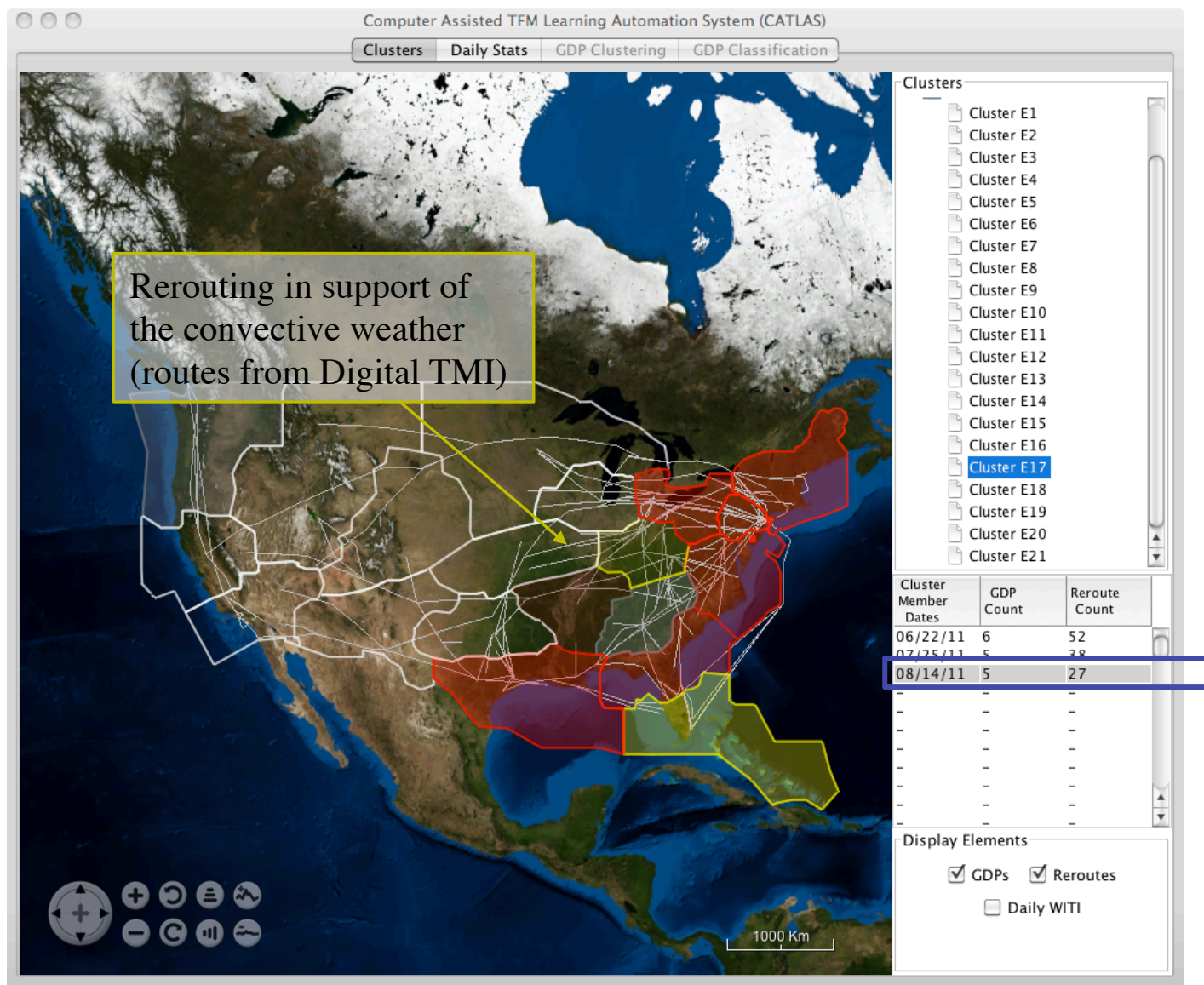
# National-level En route Clustering: Cluster 17, 3 days



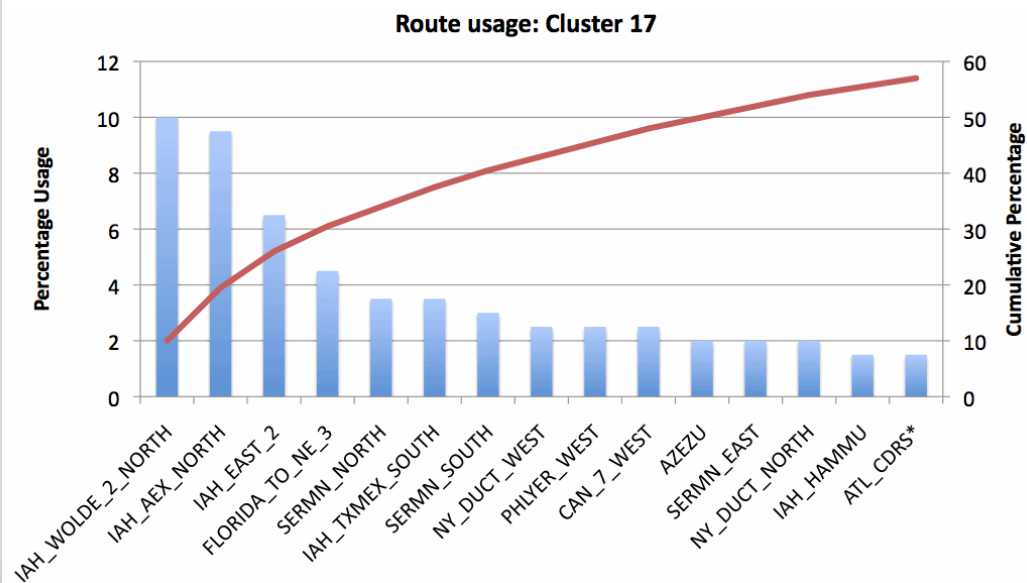


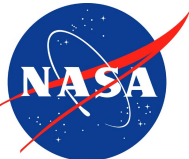


# National-level En route Clustering: Cluster 17, 3 days

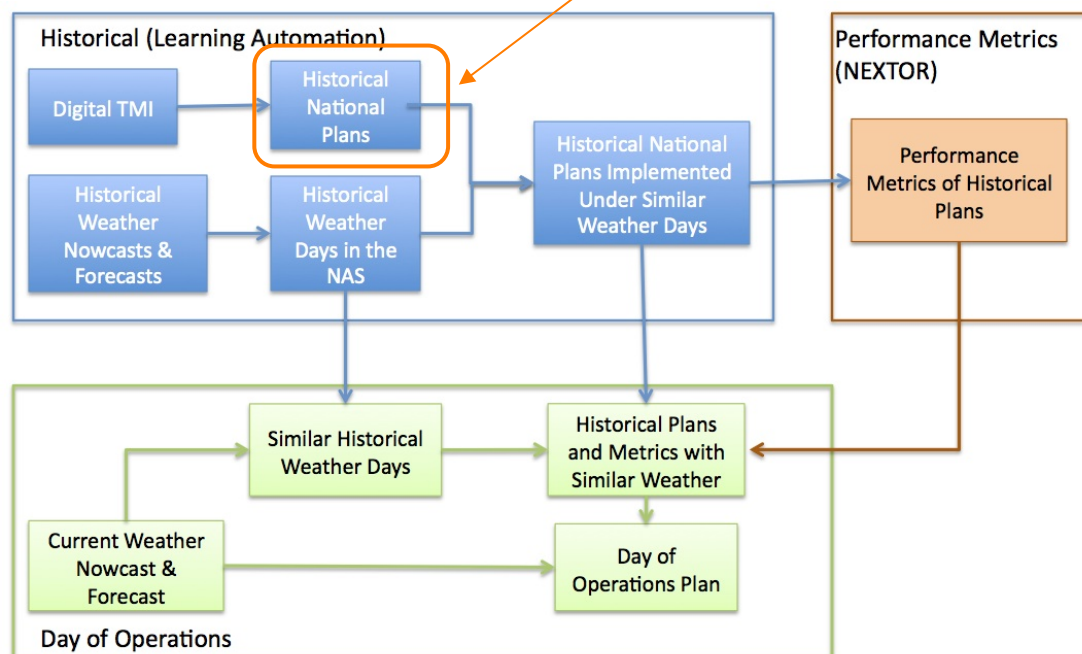


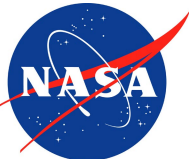




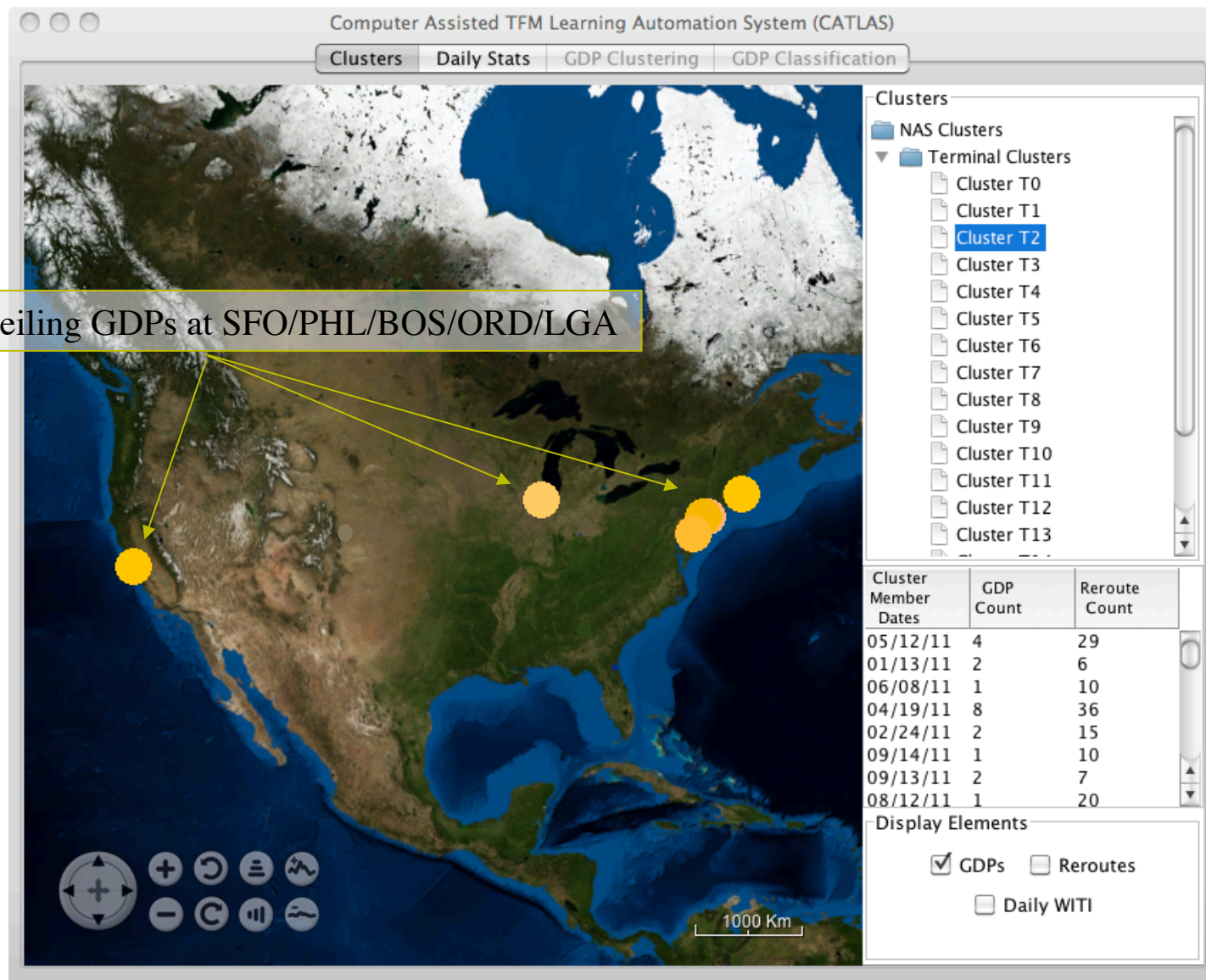


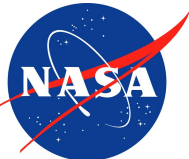
## Historical Days in the NAS: an Airport Perspective



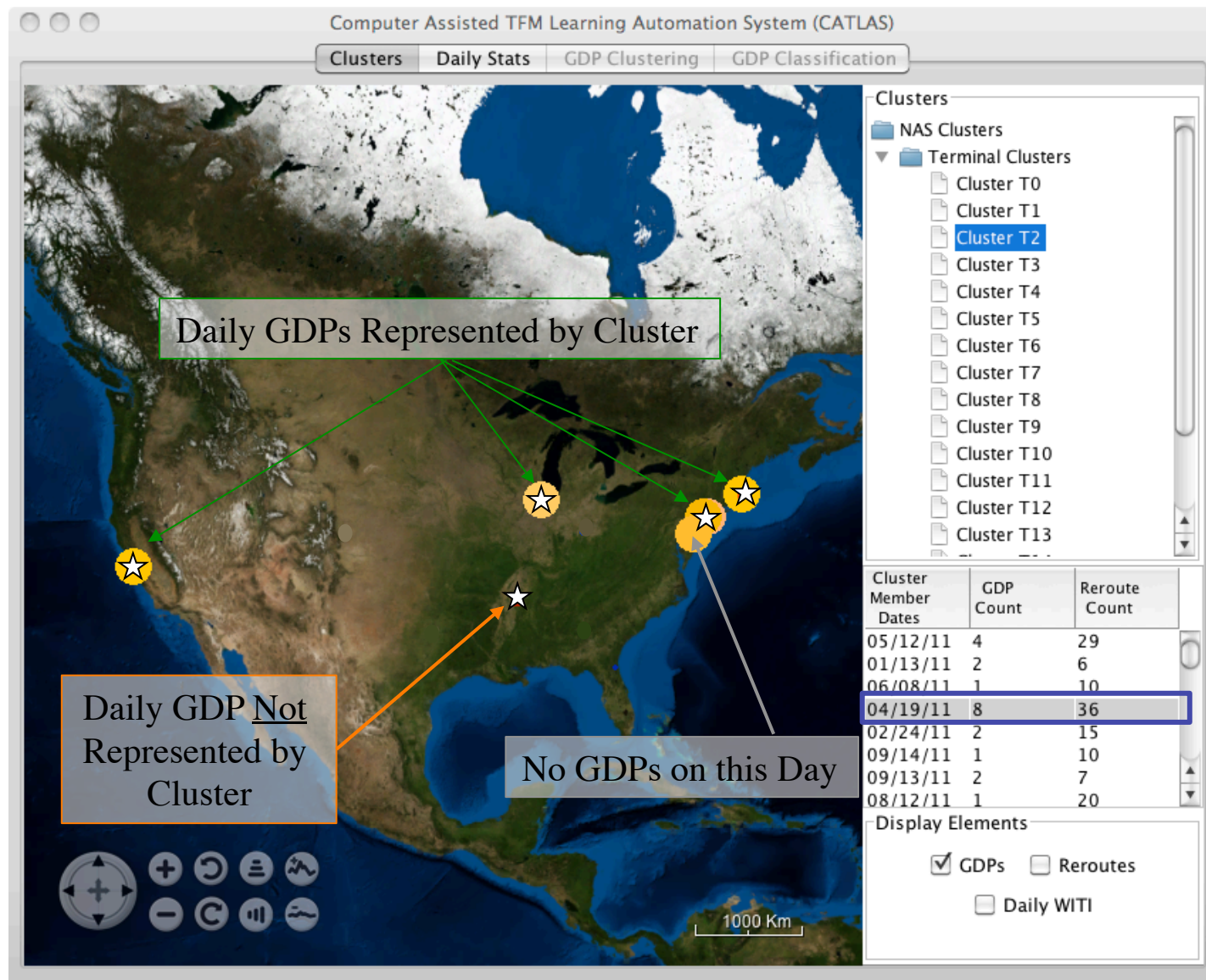


# National-level Airport Clustering: Cluster 2, 32 days

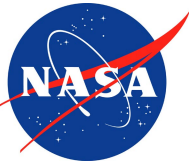




# National-level Airport Clustering: Cluster 2, 32 days



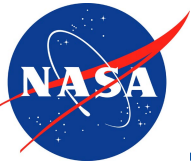




# *Next Steps*

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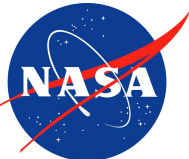
- Develop techniques to identify airport-level days in the NAS using weather observations and forecasts
- Extend airspace-level days in the NAS work to consider weather forecasts
- Explore techniques for describing the “national plans”
- Begin coordination with NEXTOR regarding performance metrics



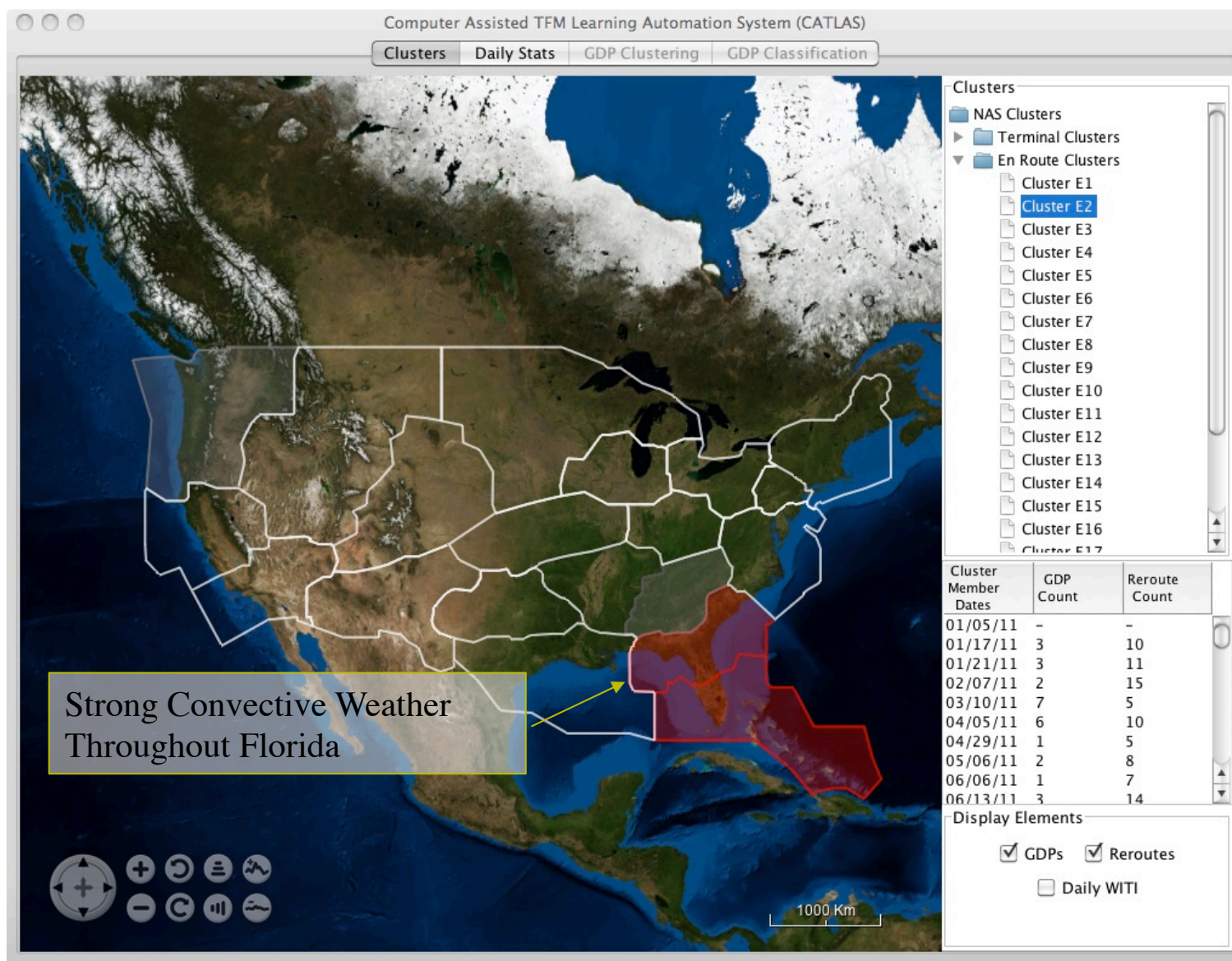
# *Backup*

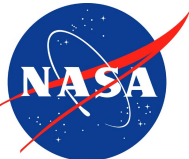
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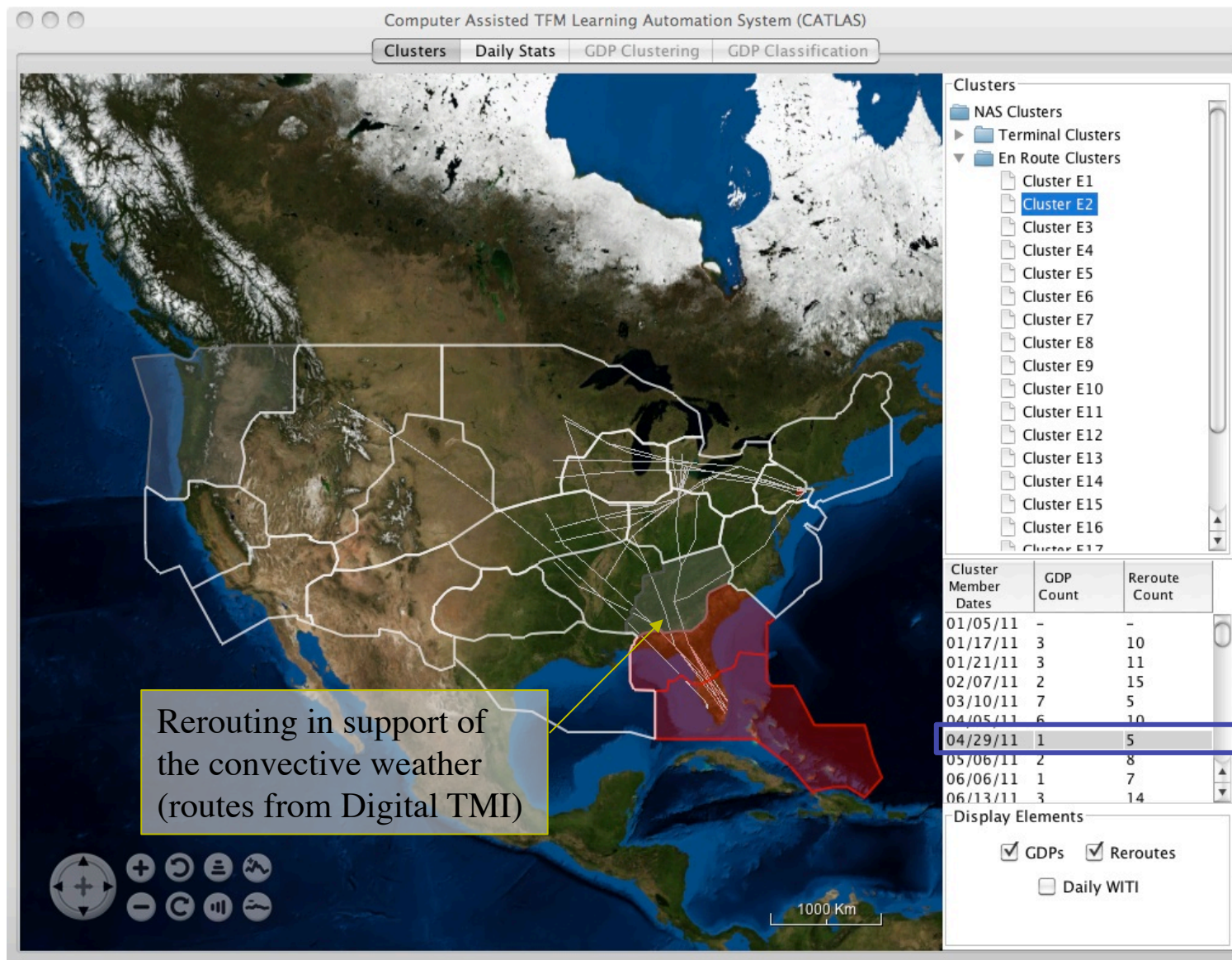


# National-level Clustering: Cluster 2, 33 days

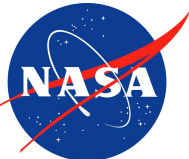




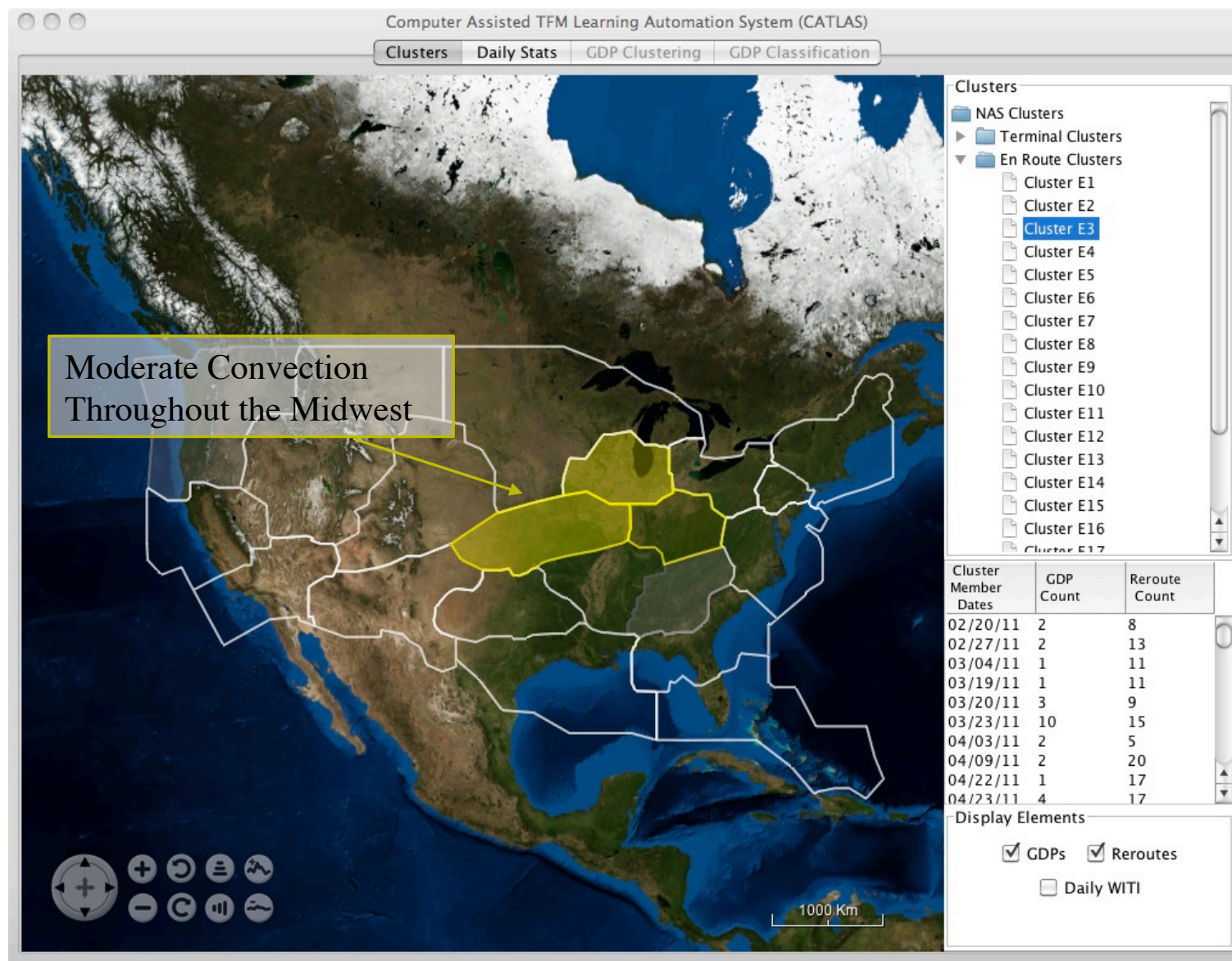
# National-level Clustering: Cluster 2, 33 days

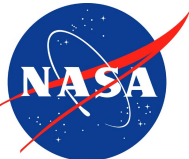






# National-level Clustering: Cluster 3, 23 days





# National-level Clustering: Cluster 3, 23 days

